

**ARM Mobile Facility One (AMF1)**

# **Safety Manual**

**– Brazil –**

**Manacapuru, Amazonas  
Brazil**

**PRO(ESH)-015.015**

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Field Instruments Deployments and Operations (FIDO)  
Los Alamos National Laboratory

[www.fido.lanl.gov](http://www.fido.lanl.gov)

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## Introduction

### Purpose:

This document describes the hazards, their mitigations, and work guidelines associated with the operations and use of the ARM Mobile Facility One (AMF1) and the Mobile Aerosol Observing System (MAOS) at the GOAmazon T3 site located near Manacapuru, Amazonas, Brazil.

### Policy:

Individuals working at or visiting the AMF1 and the MAOS at the GOAmazon T3 site on official business, for specific Intensive Operational Periods (IOP), or just for a casual visit must follow the guidelines below:

- 1) Act and work safely and not to jeopardize their own safety or that of others at the site.
- 2) Perform work in such a manner that they do not jeopardize the operation of the site.
- 3) Read all sections of the Safety Manual that apply to the work you will be doing and sign the appropriate sign-off sheets to acknowledge your personal commitment to follow the guidelines, work restrictions, and precautions associated with those sections.
- 4) All visitors to the AMF1 and the MAOS must participate in a LANL-led ES&H briefing before departing.
- 5) All visitors must submit an official Site Access Request (SAR) online at <http://www.db.arm.gov/SARS2/> and cannot go to the facility until they receive approval from the AMF1 Site Manager.
- 6) Non-working casual visitors must be escorted by on-site personnel.
- 7) LANL employees will follow LANL work safety requirements.

### Scope and Document Ownership:

- 1) This safety manual applies to activities relating to the AMF1 and the MAOS equipment and associated components. It does not cover work performed off site that is the responsibility of others.
- 2) The requirements of this document apply to all personnel who work on site to include, but not limited to, U.S. and non-U.S. subcontractors, LANL employees, and the employees of collaborating U.S. and non-U.S. organizations.

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**How to Use This Manual:**

To be authorized to perform work at the GOAmazon T3 site, each worker on an annual basis must:

- 1) Read the Standard Operating Procedure (SOP) appropriate for the work you intend to perform.
- 2) Walk through the procedure with a qualified person if that requirement is indicated.
- 3) Acknowledge you have read the procedure and agree to follow it by signing the sign-off sheet at the beginning of each SOP.
- 4) Follow the procedures in performing the work.



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## General Work Overview

**Required for:** All workers.

**General:** Overall site safety requirements not covered by a specific SOP.

**Personal Protective Equipment (PPE):** Safety Glasses required for most work as noted below. Use gloves as needed.

### 1. Orientation:

- a. Upon arrival at the site, contact the on-site technician before you perform any work.
- b. Read the Safety Manual and the SOPs specific for the work you plan to do, and sign each sign-off sheet acknowledging that you have read the SOP and that you agree to follow the guidelines.
- c. Familiarize yourself with the site layout – see Attachment 1 for site layout and container configuration.
- d. All work performed on site must be approved by the FIDO office and the on-site technician.
- e. LANL employees must additionally follow LANL work safety requirements.

### 2. General Rules:

- a. If you feel uncomfortable with the safety of any work you are asked to perform, do not do it. Instead, immediately contact the on-site technician and the FIDO management.
- b. Any site worker can recommend or order a work stoppage for safety concerns without reprisal.
- c. Clean up after yourself.
- d. For any work, use the five-step process below:
  - 1) Plan the work.
  - 2) Analyze the hazards.
  - 3) Implement controls to mitigate the hazards.
  - 4) Perform the work safely.
  - 5) Identify changes as needed to improve safety.
- e. Observe the two-person rule, and never work at the site alone. The second person should know all emergency contact information in case problems occur. (Exception: on-site technician and Radiosonde Operators).



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### **3. Site Safety Equipment, Personal Protection Equipment (PPE), and Training:**

#### **a. Fire:**

- 1) Fire extinguishers are located in all instrument containers.
- 2) All instrument containers have emergency power shutoffs near the entrance.
- 3) A flammable liquids cabinet is located in S5 van.

#### **b. General injury:**

- 1) First-aid kit is located in S2 van.
- 2) Emergency contact phone numbers are posted inside each instrument van.
- 3) Flagging is available to mark tripping hazards such as guy wires and stakes.

#### **c. Eye protection:**

- 1) Eye wash bottle is located in S2 van.
- 2) Safety glasses are available on site – wear them whenever necessary.

#### **d. Feet:**

- 1) Do not wear open-toe shoes.
- 2) Wear steel-toe shoes if ongoing foot hazard is present.
- 3) Toe protectors are available on site.

#### **e. Ears:**

- 1) Hearing protection headsets are available in A3 and S5 vans.

#### **f. Hands:**

- 1) Work gloves are available in S2 and S5 vans – use them as much as possible.

#### **g. General**

- 1) Refer to system-specific SOPs for PPE not listed here but required for other work.

### **4. Material Handling (all personnel):**

#### **a. Lifting more than the following is prohibited:**

- 1) 75 lbs. once per day.
- 2) 55 lbs. 10 times per day.
- 3) 25 lbs. above shoulders, below knees, or at arm's length 25 times per day.
- 4) 10 lbs. more than twice per minute for more than 2 hours per day.

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- b. Wear closed-toe shoes.
- c. Use dollies for moving heavy items.
- d. Operation of mechanical lifting devices such as forklifts and cranes must be by trained and authorized personnel only. When such devices are used on site, everyone not associated with the work must stay clear.

#### 5. Elevated Work Areas (all personnel):

- a. Climbing a ladder with feet above 6 feet is prohibited without conforming to *SOP – Ladder Safety*. Additional LANL employee requirements – see the SOP.
- b. Working on container roofs **without handrails** is prohibited unless conforming to *SOP – Van Roof Access Safety*. Additional LANL employee requirements – see the SOP.
- c. Access to top of radar vans is **prohibited** except by radar technicians.
- d. If the radar dish atop a radar van **stops** rotating, **do not** stand within 20 meters on an elevated position such as a ladder or other container. Note: The radar dish will stop periodically to point at the radar target, or if it is shut off, or when it malfunctions.

#### 6. Soldering operations (BOM and TBPL technicians, ARM system specialists, and LANL Employees):

- a. Have fire extinguisher is on hand.
- b. Remove all combustibles from immediate soldering area.
- c. Wear safety glasses and gloves.
- d. Keep soldering area well ventilated.
- e. Equipment to be soldered must be de-energized.
- f. Turn off soldering equipment at end of work.
- g. Store soldering equipment in labeled drawers/containers.
- h. Workers shall be authorized to use soldering equipment as per *SOP – Tool Safety*.

#### 7. Diesel Generator work (BOM and TBPL technicians and local generator technicians only):

- a. Routine checks on fluids and batteries by on-site technician.
- b. Maintenance (as per generator maintenance schedule) and repair by trained generator technicians only.
- c. Use headset ear protection when near running generator.

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- d. For work on generator battery, see SOP on electrical safety. Additional LANL employee requirements – See the SOP.

**8. Refueling Diesel Tanks (local suppliers and on-site technician only):**

- a. Diesel fuel is to be handled by local suppliers only, but fuel can be hand pumped between tanks by on-site technician.
- b. No smoking or spark-producing operations are allowed within 50 feet of refueling.
- c. Operate no heaters, burners or soldering equipment within 50 feet.
- d. Refueling shall only take place in well-ventilated areas.
- e. Only properly trained personnel are allowed to perform refueling operations.
- f. Use only the proper fuel for the device being refueled.
- g. All fuel tanks shall be protected in by secondary containment.
- h. All spills shall be reported to on-site technician and cleaned up immediately.

**9. Hazardous Materials (BOM and TBPL technicians, ARM system specialists, and on-site technician only):**

- a. Materials (lubricants, cleaning agents, chemicals) assumed to be less than 1 kg each.
- b. Read the MSDS for any chemical that is to be used.
- c. All chemicals shall be handled properly as per MSDS.
- d. Chemicals shall be stored and disposed of properly.
- e. Battery acid shall be stored in secondary containment pans.
- f. Do not store gasoline at the site unless in approved containers.
- g. Clean minor spills using absorbent towels. Dispose of properly.

**10. Instruments (BOM and TBPL technicians and ARM system specialists only):**

- a. Ceilometer's laser light is eye safe as installed in a sealed container.
- b. Micropulse Lidar (MPL) laser is eye safe in normal operating conditions; however, when opened for maintenance, pump diode is Class-4 laser and therefore an eye hazard.
- c. KA/W-Band Radar atop SACR Van:
  - 1) Access to top of SACR Van is **prohibited** except by radar technicians.
  - 2) If the radar dish atop a radar van **stops** rotating, **do not** stand within 20 meters on an elevated position such as a ladder or other container. Note: The radar dish will

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stop periodically to point at the radar target, or if it is shut off, or when it malfunctions.

**11. Pressurized Gasses (BOM and TBPL technicians, ARM system specialists, and LANL employees only):**

- a. Low-pressure gasses to be used as per manufacturer recommendations.
- b. Use cylinder dolly to move gas bottles.
- c. For helium cylinders, see *SOP – Compressed Gas (He) Cylinder Handling*. Additional LANL employee requirements – see the SOP.
- d. If working with cryogenics, LANL employees must follow LANL requirements.

**12. Personal health, recreation, weather, local hazards awareness (all personnel):**

- a. Visitors must complete an on-line Site Access Request on ARM website.
- b. Visitors may be required to take part in a pre-trip safety/logistics briefing led by LANL that includes health precautions and logistical preparation.
- c. Stay well hydrated and know the signs of heat stroke.
- d. First aid/CPR training recommended for all visitors and **required for LANL employees**.
- e. Boating – 2-person rule recommended and wear life vests.
- f. Swimming/snorkeling – 2-person rule and beware of rip tides. **Check with locals before swimming/snorkeling at any location.**
- g. Lock your hotel, home, and car doors at all times.
- h. In response to a hurricane warning – contact the FIDO Office and, if directed, secure site and go to the mainland **(see Site-Specific Hazards)**.
- i. If thunderstorm approaches the site and lightning is occurring within 2 miles, take shelter in a vehicle or in a van until condition passes **(see Site-Specific Hazards)**.
- j. Be aware of disease-bearing mosquito hazard and take appropriate precautions **(see Site-Specific Hazards)**.
- k. Be aware of poison ivy hazard and take appropriate precautions **(see Site-Specific Hazards)**.



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## Electrical Safety Overview

**Required for:** All workers who plan to use electrical equipment (e.g., tools, appliances), extension cords, or work on systems requiring lock out/tag out (qualified technicians, LANL employees only). **LANL employees must take the training directed in P 101-13.**

**General:** All personnel performing work on electrical systems and equipment will control electrical hazards by following this SOP. This procedure establishes requirements for electrical equipment, extension cords and lockout/tagout of electrical equipment, but does not cover activities beyond this that are to be performed by an electrician.

**Required equipment:** Electrical multi-meter/continuity tester, lockouts w/tags, safety glasses, insulated hand tools.

### 1. Safety Requirements:

- a. Temporary and permanent power supplies for any job site will be laid out and installed by qualified personnel only.
- b. Workers in dangerous proximity to any part of an electrical power circuit in the course of their work shall protect themselves against electrical shock by removing the power or by guarding it by effective insulation or other means.
- c. Resetting of open breakers to be done under the direction of qualified TBPL technicians or electrician. Live work shall only be completed by a licensed electrician and/or qualified technician.
- d. The 2-person rule is required during all electrical work.

### 2. Portable Electrical Equipment:

- a. Use double insulated portable industrial type electric tools and equipment meeting the requirements of the Underwriters Laboratory (UL) clearly marked "ground wire not required" – or - use portable electrical appliances and equipment where the non-current wiring metal parts that are exposed to contact with personnel are grounded by continuous conductor of adequate capacity from the device to a grounded receptacle (The AMF1 Site Manager or designee shall resolve any questions concerning a particular grounding).
- b. Grounding of receptacles shall be accomplished in one of two ways:
  - 1) A built-in ground wire of green color attached to the ground pole of the receptacle, or

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- 2) The conduit system, if installed in an approved manner, may be relied upon for grounding of a receptacle serving single phase appliances with ratings up to 230 volts.
- 3) All single-phase 15- and 20-ampere receptacle outlets operating at 120 and 240 volts, which are not part of the permanent wiring of the building or structure, must have Ground Fault Circuit Interrupter (GFCI) for personnel protection. The GFCI should be located at the power source so that all extension cords and tools are protected. In situations where GFCI protection is not practical for 240-volt equipment, follow the procedures above for assuring grounding conductors on all equipment.
- 4) Exterior outlet boxes for portable extension cords for outdoor use shall be of weatherproof type maintained in good condition.
- 5) All equipment (except for double insulated tools) and extension cord's grounding conductor shall be tested for continuity using a "continuity tester" with tone.

### **3. Electrical Guarding:**

- a. Suitable access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. The minimum clearance for the work space shall be not less than 6 feet 3 inches high, nor less than 3 feet in front of panels and live parts.
- b. The working space shall not be used for storage purposes except during shipping. The "keep clear" area must be identified with suitable floor markings and/or posting of signs or decals on the equipment.
- c. Energized parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by the use of approved cabinets or enclosures.

### **4. Lockout and Tagging:**

- a. Equipment or circuits that are de-energized shall be rendered inoperative and have tags or locks attached at all points where such equipment or circuits can be energized.
- a. Controls that are to be deactivated during the course of work on energized or de-energized equipment or circuits shall be tagged or locked out.
- b. Tags shall be placed to plainly identify the equipment or circuits on which work is being performed.
- c. All energy or potential energy shall be removed from equipment or circuits prior to maintenance beginning. All equipment controls and circuits shall be checked to verify a

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zero energy status prior to maintenance work beginning by touching the hotwire or plug prong to any ground.

- d. For lock out of equipment that uses an extension cord, either use a “plug lockout” or unplug the cord at both ends as the means of disconnect.
- e. Notify the lead technician to inspect all locked out equipment to verify that all procedures are being followed.
- f. Equipment found damaged or defective may not be used until repaired.

**5. Extension Cords:** Electrical cords and equipment connected to cords shall be visually inspected prior to each use and damaged cords removed from service. Visual inspection shall be for:

- a. Deformed, missing, or damaged pins.
- b. Insulation damage (Note: All repair insulation values must be equal to, or greater than, the original).
- c. Identification of possible internal damage.
- d. UL listing or equivalent.
- e. Continuity testing (grounding verification) for Ground Continuity - all equipment (except double insulated tools) and cord’s grounding conductor shall be tested for continuity using a “continuity tester” (with tone) at least once and marked as such with permanent marker at each end as “tested.”

**6. Electrical systems (HVAC, wiring, transformers, UPS, power panels):**

- a. Work on low voltage DC systems (UPS systems and generator/vehicle batteries) by qualified personnel only. Always wear proper PPE (safety glasses, gloves, insulated tools).
- b. Work on 220 VAC, 3-phase or 110 VAC, 1-phase exposed connectors by certified electricians only.
- c. Work on 220 VAC or 110 VAC systems by certified electricians only.
- d. Opening of AC distribution, control cabinets, or enclosures when power is applied by qualified electricians only.
- e. All electrical loads must be disconnected and locked out before connecting or disconnecting the main AC power cables to any system or van.
- f. All energized electrical work, other than diagnostics and testing, shall be performed de-energized whenever possible. LANL may approve procedures for energized electrical R&D work when the following items have been addressed:



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- 1) Potential hazards associated with the task.
  - 2) Minimum work clearances required
  - 3) What barricades are required and their placement.
  - 4) What personal protective equipment is required.
  - 5) Test instruments to be used.
  - 6) Proper instructions for safety using test instruments.
  - 7) Minimum number of workers required to do the task.
  - 8) Description of the duties of each worker.
  - 9) Sequence of steps which affect safety.
  - 10) Lockout/Tag out required for all work on energized systems.
- g.** Only local utility power company technicians are allowed to work on utility owed equipment and power supplies over 416V.



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## Tool Safety Overview

**Required for:** All workers who plan to use tools.

**General:** All workers at the AMF1 facility shall use only safe tools and use them in a safe manner. Read tool operation manuals for manufacturer's recommendations.

**Personal Protective Equipment (PPE):** Safety glasses, gloves.

1. **Safety Requirements:** All hand tools, power tools, soldering irons and other similar equipment shall be UL listed and maintained in a safe operating condition. Tools provided by other organizations shall be provided with safe operating procedures. Workers using tools shall be responsible for the inspection and repair of tools under their control.
2. **Hand Tools:** Use insulated or non-conducting tools when working near energized electrical circuits.
3. **Power Tools (including soldering equipment):**
  - a. Authorized users:
    - 1) Only BOM and TBPL technicians, ARM system specialists, and LANL technicians are pre-authorized to use and repair tools of their trade.
    - 2) Other users such as non-technical LANL employees, balloon launchers, local contracted help, can be authorized by demonstrating their expertise to BOM and TBPL technicians (or others designated by FIDO) and document this authorization on the attached sign-off sheet. In addition, do not attempt any operation that an authorized user:
      - is unfamiliar with;
      - is uncomfortable with;
      - has not been trained to perform;
      - has not been approved to perform.
  - b. Before using a power tool, verify voltage and frequency (i.e., 120V, 60hz vs. 240V, 50hz) of power tool to match outlet to be used.
  - c. Replace, or have repaired, all worn or damaged tools. Clean, test and inspect all tools regularly.
  - d. Power tools shall not be used if safety equipment, such as shields, tool rests, hoods and guards have been removed or otherwise rendered inoperative.
  - e. Workers using tools under conditions that expose them to the hazards of flying objects of harmful dusts shall use the required personal protective equipment.

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- f. Use double insulated portable industrial type electric tools and equipment meeting the requirements of the Underwriters Laboratory (UL) clearly marked “ground wire not required” – or - use portable electrical tools that are properly grounded (with 3 prong plugs). Tools used outside shall be powered by outlets with GFIC.
- g. Gasoline powered tools shall not be used in unventilated areas. Gasoline shall be dispensed only in UL approved safety cans and only after tool has been allowed to cool to prevent accidental gasoline ignition.
- h. Portable grinders shall be provided with hood type guards with side enclosures that cover the spindle and at least 50% of the wheel. All wheels shall be of the proper type, shall not exceed the grinder rating, and shall be inspected regularly for signs of fracture.

#### 4. Cutting Tools:

- a. All cutting tools shall be guarded in such a manner as to prevent body contact with rotating or reciprocating blades.
- b. Always keep body parts clear of cutting parts and **cut away** from your body.



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## Ladder Safety Overview

**Required for:** All workers who use ladders (with feet higher than 6 feet). LANL employees must additionally take LANL Fall Protection Program (P101-20) and take LANL Ladder Safety Training #12985.

**General:** Applies to safe use of ladders.

**Required equipment:** Tie-off rope for top of ladder.

**Ladder Use Rules:** Before using any ladder, check it for defects, missing rungs, feet, or hardware (cracks in the side rails, corrosion or other damage). Repair or replace damaged ladders. Do not use a ladder that is in disrepair. Do not use painted ladders as the paint may conceal cracks or splits. Keep ladders clean and free from dirt and grease, which might conceal defects. If a ladder is to be replaced, immediately cut it in half to prevent its further use.

### 1. Safety Requirements:

- a. As soon as a ladder is placed, it must be tied off at the top and firmly placed at the bottom.
- b. Never put a ladder on top of boxes, tables, drums, forklifts, etc.
- c. When placing a ladder, be certain the side rails extend three feet above the top landing. This means placing the third rung even with the landing edge.
- d. Extension ladders must overlap a minimum of three rungs. Always ensure the hardware is fully engaged.
- e. Place ladders so that the distance from the foot of the wall is  $\frac{1}{4}$  of the height of the landing edge. To help estimate, rungs are spaced one foot apart.
- f. Always wear shoes with substantial soles when using a ladder. Ensure that shoes are relatively clean, with no large amounts of mud, tar, or other substances on the soles.
- g. Never place a ladder in front of a door unless the door is locked, blocked or otherwise guarded.
- h. Do not use ladders in a horizontal position as runways or as scaffolds.
- i. Do not place a ladder against a windowpane or sash.
- j. When placing a ladder, make certain that both side rails have secure footing. Always provide solid footing on soft ground to prevent the ladder from sinking.
- k. Never lean a ladder against unsafe backing, such as loose boxes or barrels, posts, tree trunks, etc.

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- l.** Always face the ladder and hold on with both hands when going up or down. Do not carry things up or down a ladder. If tools or material must be handled, raise or lower them with a rope.
- m.** Do not allow more than one person at a time to use a ladder.
- n.** Keep ladders away from power lines. Assume all electrical lines are energized.
- o.** Do not climb higher than the third rung from the top on strait or extension ladders, or the second tread from the top on stepladders.
- p.** Do not use makeshift ladders, such as cleats fastened across a single rail.
- q.** Before starting to climb a stepladder, ensure that the ladder is fully open and the spreader/divider is locked in place.
- r.** A ladder must be set in a clear space, both on the ground and on the landing edge level, so that it is not necessary to climb over a pile of scrap to get onto the ladder, or necessary to dodge a “hot” line or other debris to get off the ladder.
- s.** Do not use a ladder in a strong wind except in an emergency, and then only when it is securely tied.
- t.** Do not leave a placed ladder unattended, especially outdoors, unless it is anchored at the top and bottom.
- u.** Never reach off to the sides while on a ladder.
- v.** Never walk under a ladder – very bad luck!





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## Van Roof Access Safety Overview

**Required for:** All workers accessing the top of a van that has no handrails.

**General:** The roof area of an instrument van without handrails is to be considered a Controlled Access Zone (CAZ). This plan is needed for access to van roof areas that are accessed infrequently and therefore do not have handrails. LANL employees must additionally take the work safety training LANL Fall Protection Program (P101-20).

**Required equipment:** Ladder for van roof access, tie-off rope.

### 1. Van Roof Work Rules:

- a. Work on a van roof CAZ shall be done only with an additional worker to act as a "Safety Monitor."
- b. The safety monitor shall be a competent person who has read this procedure and who is capable of identify existing and predictable hazards in the surroundings of working conditions that are hazardous.
- c. Immediately after a worker climbs a ladder to the van roof, the "Safety Monitor" follows that worker on the same ladder to a height that enables him/her to be in visual view of the worker.
- d. The "Safety Monitor" shall be on the same plane as the work area, be in visual contact with the workers, and close enough to communicate orally with the workers on the van roof.
- e. The worker on the van roof shall stay at least two feet back from any van roof edge.
- f. The worker on the van roof shall maintain three points of contact to the surface (combination of hand, foot, knee, etc.) if possible.
- g. The "Safety Monitor" shall watch the worker on the roof at all times and warn him/her of any dangerous situations (i.e., too close to the edge, working in an unsafe manner, high winds, obstructions, etc.).
- h. The "Safety Monitor" shall not have other responsibilities which could distract him/her.
- i. Workers on a van roof CAZ must comply with any hazard warnings from the "Safety Monitor."



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## Compressed Gas Cylinder Handling Overview

**Required for:** On-site technician and Radiosonde Operators (also referred “balloon launchers”), who handle helium cylinders in the Balloon Borne Sounding System (BBSS) operation. LANL employees must additionally follow the requirements of the LANL Pressure Safety Program (P101-34) and take LANL Gas Cylinder Safety Training #9518.

**General:** The purpose of this procedure is to provide general guidelines safe handling of compressed gas cylinders such as helium.

**Personall Protective Equipment (PPE):** Safety Glasses.

**Cautions and Hazards:** Hazards generally associated with compressed gas cylinders are oxygen depletion, and mechanical injury if not handled, operated, and stored properly.

### 1. General Handling:

- a. Leave cylinders in place and secured to prevent them from falling and damaging the valves/regulator.
- b. Keep cylinder valve caps in place at all times, except when the cylinder is installed and connected to a pressure system.
- c. Replace the valve cap when cylinder is empty and mark it with an “X.”
- d. Never force a valve open, and always open cylinder valves slowly.
- e. Maintain cylinders in good condition and maintain all cylinder labels.
- f. Cylinder shall be legibly marked with labels that identify the operating pressure, temperature, material of construction and contents.
- g. No maintenance or repair work on a cylinder shall be performed.
- h. Cylinders with damaged valves **must not be used** and shall be returned to the supplier noting the defect.
- i. Moving cylinders:
  - 1) Remove regulator and hose from the cylinder before moving it from the secured, in-use position.
  - 2) Move the cylinder on a cylinder dolly securing with restraining chain or strap fastened.
  - 3) Do not roll or drop cylinders.
  - 4) Do not lift cylinders by their protective caps or valves.

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## **2. Valves and Regulators in General:**

- a. All cylinders shall have a shutoff valve designed according to the Compressed Gas Association standards. This valve cannot be used to control the discharge rate; therefore a regulator must be connected to the cylinder while it is in use.
- b. Use only a regulator that has been approved for the gas in use.
- c. Do not attempt to repair a regulator. Expert repair and calibration of regulators is necessary for continued reliability and safety. Do not use an adapter.
- d. Each part of a compressed gas system that can be pressurized separately must be protected by a pressure relief device set to operate at pressure equal to or less than the Maximum Allowable Working Pressure (MAWP).

## **3. Moving Regulator Gauge Apparatus from Empty Cylinder to Full Cylinder:**

- a. Put on safety glasses.
- b. On a full cylinder, remove outer cap, and then remove outlet plug using Allen wrench.
- c. Close the cylinder valve of the empty cylinder, and open the hose valve.
- d. Remove regulator gauge apparatus from the empty cylinder using open-end wrench
- e. Put on outlet plug loosely and mark the empty cylinder with "X" to indicate that it is empty.
- f. Attach regulator gauge apparatus to the full cylinder using open-end wrench.
- g. Close the hose valve.
- h. Open the valve on the full cylinder completely, and then turn it back ¼ turn. (Note: Put your ear near the hose connection to listen for leaks.)
- i. The cylinder is now ready for balloon filling.



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## Manacapuru T3 Site-Specific Hazards Overview

**Required for:** All workers.

**Personal Protective Equipment (PPE):** Antimalarial medicine, first-aid kit, work gloves, hat, sunscreen, safety glasses, sunglasses.

### 1. Heat Exhaustion

(Sources: [www.webmd.com](http://www.webmd.com); [www.mayoclinic.com](http://www.mayoclinic.com))

Heat exhaustion is an illness often caused by long exposure to high temperatures and humidity combined with strenuous physical activities. The weather in the Amazon region, with its consistently high temperatures and humidity, create an ideal environment for one to suffer from the body's failure to cool itself.

There are two types of heat exhaustion as follows:

- 1) Salt depletion – signs include frequent muscle cramps, dizziness, nausea, and vomiting.
- 2) Water depletion – signs include extreme thirst, weakness, headache, and loss of consciousness.

While heat exhaustion is generally not life-threatening, without proper and prompt treatment, it can progress to heat stroke, which can damage brain and vital organs and even cause death.

#### a. Symptoms:

- Confusion
- Dark-colored urine – a sign of dehydration
- Dizziness
- Fainting
- Fatigue
- Headache
- Muscle cramps
- Nausea
- Pale skin
- Profuse sweating
- Rapid heartbeat

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**b. Treatment:**

- Rest in a cool place – getting into an air-conditioned building is ideal (e.g., S1, S2, MAOS vans), but at the least, find a shady spot. Lie on your back with your legs elevated higher than your heart level.
- Drink cool fluids – stick to plain water or sports drinks. Do not drink any alcoholic or caffeinated beverages, which can contribute to dehydration.
- Apply cool water or ice to your skin – if possible, take a cool shower or douse yourself with water. Do not use alcohol on your skin.
- Loosen clothing – remove any unnecessary clothing and make sure your clothes are lightweight and nonbinding.

If any of these treatment methods does not make you feel better within 30 to 45 minutes, seek medical attention immediately.

**c. Prevention:**

The following are some recommendations for helping to avoid heat exhaustion.

- Wear light-colored, lightweight, loose-fitting, moisture-wicking clothing.
- Avoid sunburn – wear a hat, sunglasses, and UV-blocking clothing.
- Take a short break in a cool place often.
- Drink plenty of fluids.
- Take extra precautions with certain medications – ask your doctor or pharmacist whether the medications you are taking make you more vulnerable to heat exhaustion and, if so, what you can do to keep your body from overheating.
- Let your body acclimate to the heat – consider working shorter hours for the first few days.

## **2. Malaria**

(Sources: [www.cdc.gov](http://www.cdc.gov); [www.webmd.com](http://www.webmd.com))

Malaria began to reemerge in the Amazon region of South America in the 1990s, and it is recommended that you take prescription anti-malaria medicine during your stay in the region.

Malaria is transmitted among humans by female mosquitoes of the genus *Anopheles*. Female mosquitoes take blood meals to carry out egg production, and such blood meals are the link between the human and the mosquito hosts in the parasite life cycle. The successful development of the malaria parasite in the mosquito (from the "gametocyte" stage to the "sporozoite" stage) depends on several factors. The most important is ambient temperature

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and humidity (higher temperatures accelerate the parasite growth in the mosquito) and whether the Anopheles survives long enough to allow the parasite to complete its cycle in the mosquito host ("sporogonic" or "extrinsic" cycle, duration 10 to 18 days). Differently from the human host, the mosquito host does not suffer noticeably from the presence of the parasites.

**a. Symptoms:**

The classical (but rarely observed) malaria attack lasts 6-10 hours. It consists of the following stages:

- 1) Cold stage – sensation of cold, shivering
- 2) Hot stage – fever, headaches, vomiting; seizures in young children
- 3) Sweating stage – sweats, return to normal temperature, tiredness

Patients commonly present the following symptoms:

- Fever
- Chills
- Sweats
- Headaches
- Nausea and vomiting
- Body aches

Physical findings may include the following:

- Elevated temperatures
- Perspiration
- Weakness
- Enlarged spleen
- Mild jaundice
- Enlargement of the liver
- Increased respiratory rate

**b. Treatment:**

Treatment of malaria depends on many factors including disease severity, the species of malaria parasite causing the infection and the part of the world in which the infection was acquired. The latter 2 characteristics help determine the probability that the organism is resistant to certain antimalarial drugs. Additional factors such as age, weight, and pregnancy status may limit the available options for malaria treatment.



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Malaria, especially Falciparum malaria, is a medical emergency that requires a hospital stay. Chloroquine is often used as an anti-malarial medication. However, chloroquine-resistant infections are common in some parts of the world.

Possible treatments for chloroquine-resistant infections include the following:

- The combination of quinidine or quinine plus doxycycline, tetracycline, or clindamycin
- Atovaquone plus proguanil (e.g., Malarone)
- Mefloquine or artesunate
- The combination of pyrimethamine and sulfadoxine (e.g., Fansidar)

Medical care, including fluids through a vein (IV) and other medications and breathing (respiratory) support may be needed.

**c. Precautions for workers:**

- 1) Take antimalarial medication with at all time.
- 2) Wear hat and light-colored clothing, long-sleeved shirts, long pants (tucked into boots or socks) whenever possible.
- 3) Use insect repellents.

### **3. Lightning**

Lightning seeks the easiest route (but not necessarily the shortest) between positive regions within a cloud or between positive charges on the ground and negative charges in the cloud. Go inside immediately if lightning activity is within 2 miles (5 seconds per mile after flash the sound of thunder arrives). If lightning occurs, the guidelines below:

**a. When outside:**

- 1) Avoid water, high ground, and open spaces.
- 2) Avoid all metal objects (e.g., wires, fences, machinery, motors, and power tools).
- 3) Automobiles provide a safer shelter because the metal body creates a pathway for the lightning around your body. Avoid contact with metal objects in the car where your body could become a pathway.
- 4) Unsafe places include canopies, picnic shelters, and trees.
- 5) Sit on some insulating material if possible such as coiled rope, wooden pack board, folded sleeping bag, and wool shirt.
- 6) Assume a crouched position sitting on your feet with knees drawn up and feet close together. Avoid any position with a hand, shoulder, or head touching a surface.

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7) Avoid proximity to other people (minimum of 15 feet).

**b. When inside:**

- 1) Avoid water. Stay away from doors and windows. Do not use telephone or headsets. Turn off, unplug, and stay away from appliances, computers, power tools, and TVs. Lightning may strike exterior electrical poles and phone lines, inducing shocks to inside equipment.
- 2) Suspend activities for 30 minutes after the last observed lightning or thunder.

## Attachment 1: T3 Site Layout

